

REMARKS

Claims 1, 4, 11-17 remain pending. Independent claims 1, 4, 13 and 17 have been amended. No new matter was added. Arguments for the patentability of the claims over the prior art of record are presented. Accordingly, Applicants respectfully submit that the present application is in condition for allowance.

I. Claim Rejections - 35 USC §103(a)

A. *In the non-final Office Action dated December 22, 2009, claims 1 and 13-16 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,521,062 B1 issued to Bartholomeusz et al.*

Claims 1 and 13-16 of the present application are directed to the structure of a particular type of sputtering target, including the surface structure of the target.

The cited prior art reference, Bartholomeusz et al., discloses an alloy material and a method of forming the alloy material. This material can ultimately be subjected to cutting to form sputtering targets.

For example, Bartholomeusz et al. disclose steps of melting, casting, annealing and rolling the bulk material of the alloy to form a “rolled plate”. Specifically with respect to sputtering targets, Bartholomeusz et al. merely state that sputtering targets are “cut” out of the rolled plate (see Abstract and claims 12 and 13 of Bartholomeusz et al.).

However, Bartholomeusz et al. disclose absolutely nothing with respect to how the bulk material is cut and/or finished to form a sputtering target and what, if any, surface processing steps are utilized. In addition, Bartholomeusz et al. disclose absolutely nothing with respect to defects (cracks, dents, fallouts, etc.) that arise in sputtering targets due to surface processing of the sputtering target (including “cutting”). Accordingly, it would not be obvious to one of ordinary skill in the art at the time of the invention following the teachings of Bartholomeusz et

al. to provide surface processing to a target of a type claimed by the present invention such that “surface defects of 10 μ m or more resulting from machine work do not exist” (see this limitation stated in claims 1 and 13 of the present application).

In the Office Action, it is stated that Bartholomeusz et al. do not subject a target to “machine work”. Applicants respectfully disagree. The Abstract of Bartholomeusz et al. clearly states that sputtering targets “are cut out of the rolled plate” and claims 12 and 13 of Bartholomeusz et al. state a step of “cutting a sputtering target from the rolled plate”. These cutting steps are clearly machine working steps that will cause defects in a target of the type required by the claims of the present application.

Claims 1 and 13 of the present application have been amended to require that the target body is one that is prepared by melting, casting, rolling, cutting and polishing. No new matter was added. In addition, the specification of the present application has been amended to insert the word “melting” for the word “dissolution” and the step of “casting” has been inserted after melting. No new matter was added. It is inherent that the step of “casting” follows the step of “melting” before such material can be rolled.

Bartholomeusz et al. fail to disclose polishing and/or any surface processing techniques other than cutting the targets from a bulk material.

Thus, for the above reasons, Applicants respectfully submit that the sputtering targets claimed by claims 1 and 13-16 of the present application are patentable and not obvious over Bartholomeusz et al. because the cited reference fails to disclose surface processing techniques (other than bulk cutting) and clearly would not provide a target of a type claimed by the present invention such that “surface defects of 10 μ m or more resulting from machine work do not exist”.

Applicants respectfully request reconsideration and removal of the obviousness rejection based on the Bartholomeusz et al. patent.

B. In the non-final Office Action dated December 22, 2009, claims 4, 12 and 17 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,521,062 B1 issued to Bartholomeusz et al. in view of JP 2002-208125 A and further in view of U.S. Patent No. 6,153,315 issued to Yamakoshi et al. and still further in view of U.S. Patent No. 5,460,793 issued to Kano et al.

Claims 4, 12 and 17 of the present application are directed to methods of finish processing a specific type of sputtering target.

As discussed above, Bartholomeusz et al. fail to disclose any surface processing steps applied to a sputtering target other than the cutting of the target from a bulk material. Accordingly, assuming the target disclosed by Bartholomeusz et al. is identical to the type of target required by the claims of the present application, the resulting target of Bartholomeusz et al. will have the surface defect problems discussed in the present application.

With respect to the reliance on JP ‘125, it should be clearly understood that JP ‘125 does not recommend polishing as a final surface finishing process step. This is because JP ‘125 teaches that if polishing is performed, abrasive grains will become embedded in the target material surface and films produced from the target will not have desired characteristics. Thus, JP ‘125 teaches away from the claims of the present application and specifically teaches that polishing is not effective in eliminating surface defects. For example, JP ‘125 states that:

“When polishing finishing performed surface finish, the abrasive grain sank in the target material surface, and it was thought that it became a cause of membrane-characteristics degradation.” [See Paragraph No. 0004.]

Applicants respectfully submit that it is well established that “teaching away” is the antithesis of the art suggesting that the person of ordinary skill in the art go in the claimed direction. Essentially, “teaching away” is a per se demonstration of lack of obviousness. In re Fine, 873 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Consequently, there is no motivation provided by JP ‘125 for utilizing polishing on the target disclosed by the Bartholomeusz et al. patent. JP ‘125 teaches that polishing causes a “degradation” of the surface and thus teaches-away from the combination of the steps of cutting **and** polishing required by claims 4 and 17 of the present application. Accordingly, Applicants respectfully submit that the JP ‘125 provides a contrary teaching to the claims of the present application and would lead one of ordinary skill in the art at the time of the invention away from the method claimed by the present application, not toward it.

JP ‘125 performs dry etching after cutting work to smooth the surface of the target material or controls the feed rate of the cutting work with a lathe as a final surface finishing step. Accordingly, the steps required by claims 4 and 17 of the present application would not be obvious from a combination of Bartholomeusz et al. and JP ‘125 because JP ‘125 teaches away from the polishing step required by claims 4 and 17.

With respect to the Yamakoshi et al. patent, it teaches polishing with precision cutting using a diamond cutting tool to reduce the thickness of the affected layer of a surface of a Ti, Ta or Cu target. With respect to Kano et al., it also teaches that it is effective to perform distortionless ion milling, sputtering, electropolishing or the like to eliminate the target surface, form a smooth surface, and eliminate the affected layer specifically with respect to a metal silicide sintered compact target.

It is clearly understood by one of ordinary skill in the art at the time the present invention was made that surface finishing techniques used on sputtering targets are an important factor that considerably affects the properties and productivity of sputtered films. The method of surface finishing depends on the material components of the sputtering target, the objective of the surface finishing process, and other factors, and there is no standard surface finishing method that can be applied to all sputtering targets irrespective of the type of target. If the material of the

target is different or the objective of the surface finishing process is different, than the suitable surface finishing method may differ.

The sputtering target material to be processed in Yamakoshi et al. is a single layer metal (Ti, Ta, or Cu), and the sputtering target material to be processed in Kano et al. is a metal silicide. These disclosed sputtering target materials are greatly different from the targets required by claims 4 and 17 of the present application which require a phase having a hardness difference of at least 1.5 times a co-existing phase of the target.

Moreover, since Yamakoshi et al. and Kano et al. are directed at reducing the thickness of an affected flow layer and eliminating the surface without distortion, they clearly differ from the objective of the present invention which is to eliminate “surface defects of 10 μ m or more resulting from machine work”. Thus, the present invention provides an unexpected result relative to the required type of material of the sputtering target required by the claims of the present application. In addition, the polishing method of Yamakoshi is only able to exhibit its effect by being combined with diamond precision cutting.

It would have only been obvious for one of ordinary skill in the art at the time the present invention was made to apply the methods of Yamakoshi et al. and Kano et al. to their respective disclosed materials for the stated objectives. It would not have been obvious at the time the present invention was made to deviate from the methods with respect to the specific materials to be processed and the specific objectives of the processing. Accordingly, since the effect of the surface finishing methods disclosed by Yamakoshi et al. and Kano et al. are considerably different from the present invention, it would not be appropriate to conclude that it would be obvious to expand the application of the foregoing technologies to a sputtering target of a type required by the present invention.

Accordingly, Applicants respectfully submit that the specific combination of method steps recited in claims 4 and 17 on the specific type of sputtering target material required by claims 4 and 17 are novel and non-obvious relative to Bartholomeusz et al. in view of JP ‘125 and further in view of Yamakoshi et al. and the Kano et al. patent.

Accordingly, Applicants respectfully request reconsideration and removal of the obviousness rejection of claims 4, 12 and 17.

C. *In the non-final Office Action dated December 22, 2009, claim 11 is rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,521,062 B1 issued to Bartholomeusz et al. in view of JP 2002-208125 A further in view of U.S. Patent No. 6,153,315 issued to Yamakoshi et al. and still further in view of U.S. Patent No. 5,460,793 issued to Kano et al. and yet further in view of U.S. Patent No. 4,895,592 issued to Hatwar.*

Hatwar discloses technology of reducing defects by adjusting conditions during a melting process. This is clearly different from the method required by the claims of the present application which eliminates “defects of 10µm or more resulting from machine work” as a result of performing cutting in advance, and thereafter performing finishing work by way of polishing. Further, the material to be processed in Hatwar is a rare earth-transition metal material, and this material is clearly different than that required by the claims of the present application.

Applicants respectfully submit that claim 11 is patentable and not obvious over Bartholomeusz et al. in view of JP ‘125, Yamakoshi et al., Kano et al., and Hatwar for the same reasons claim 4 is patentable and not obvious over Bartholomeusz et al. in view of JP ‘125, Yamakoshi et al., and the Kano et al. patent. See arguments above. In addition, Hatwar fails to overcome any of the above referenced deficiencies with respect to Bartholomeusz et al., JP ‘125, Yamakoshi et al. and Kano et al. discussed above.

Accordingly, Applicants respectfully request reconsideration and removal of the obviousness rejection of claim 11.

III. Conclusion

In view of the above amendments and remarks, Applicants respectfully submit that the claim rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

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